

WHAT IS CLAIMED IS:

12. (amended) A method for surface treating wafer surfaces, comprising the steps of:

providing a wafer surface having a low-k dielectric layer disposed thereon and a photoresist layer overlying the dielectric layer; and

D<sub>1</sub> treating the wafer surface to remove at least a portion of the low-k dielectric layer with minimal removal of the photoresist layer, by applying an aqueous 2:1 (v/v) solution of hydrofluoric acid and one or more organic acids, the solution having a pH of about 2 to about 6, such that the dielectric layer is selectively removed at a rate of greater than about 2000 angstroms per minute.

13. (amended) The method of Claim 12, wherein the aqueous solution comprises hydrofluoric acid and the one or more organic acids in a ratio of about 2:1 (v/v), such that the low-k dielectric layer is selectively removed at a rate of about 2300 to about 2700 angstroms per minute.

26. (amended) A method of cleaning wafer surfaces, the method comprising the steps of:

providing an aqueous 2:1 (v/v) solution comprising hydrofluoric acid and an organic acid selected from the group consisting of citric acid, acetic acid, ascorbic acid, and mixtures thereof;

D<sub>2</sub> providing a wafer having a low-k dielectric material disposed on at least a portion of one surface; and

contacting the surface of the wafer having the low-k dielectric material thereon with the aqueous solution under conditions effective to remove at least a portion of the low-k dielectric material at a rate greater than about 1000 angstroms per minute.

D<sub>3</sub> 28. (amended) The method of Claim 26, wherein the aqueous solution comprises about 63 to about 70 % by volume of hydrofluoric acid, and about 30 to about 36 % by volume of organic acid.

79. (amended) A method of cleaning a surface of a semiconductor substrate, comprising the steps of:

D4 applying an aqueous solution to selectively remove low-k dielectric material from the surface of the substrate, the aqueous solution effective to selectively remove the low-k dielectric layer at a rate greater than about 2000 angstroms per minute; the aqueous solution comprising a 2:1 (v/v) ratio of hydrogen fluoride and one or more inorganic acids, and having a pH of about 2 to about 5.

111. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

D5 applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material and up to a minimal amount of organic material therefrom; the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5.

112. The method of Claim 111, wherein the aqueous solution removes the dielectric material at a rate of greater than about 1000 angstroms per minute.

113. The method of Claim 111, wherein the aqueous solution removes the dielectric material at a rate of greater than about 2000 angstroms per minute.

114. The method of Claim 111, wherein aqueous solution removes the organic material at a rate of about 1 angstrom per minute.

115. The method of Claim 111, wherein the aqueous solution provides an etch selectivity ratio for the dielectric material to organic material of about 50:1 to about 1000:1.

116. (amended) The method of Claim 111, wherein the aqueous solution further comprises ammonium fluoride.

117. The method of Claim 111, wherein the organic acid is selected from the group consisting of citric acid, gallic acid, acetic acid, formic acid, propionic acid, n-butyric acid, isobutyric acid, benzoic acid, ascorbic acid, gluconic acid, malic acid, malonic acid, oxalic acid, succinic acid, tartaric acid, and mixtures thereof.

118. The method of Claim 111, wherein the organic acid is selected from the group consisting of citric acid, acetic acid, ascorbic acid, and mixtures thereof.

119. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material therefrom at a rate of greater than about 2000 angstroms per minute; the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5.

120. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material therefrom at an etch selectivity ratio for the dielectric material to organic material of about 50:1 to about 1000:1; the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5.

121. (amended) The method of Claim 120, wherein the aqueous solution selectively removes the dielectric material at a rate of about 2300 to about 2700 angstroms per minute.

122. The method of Claim 120, wherein the aqueous solution selectively removes the dielectric material at a rate of greater than about 2000 angstroms per minute.

## Replacement Claims

123. A method of treating a surface of a semiconductor substrate, comprising the step of:  
applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material and up to a minimal amount of organic material therefrom; the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5.

124. The method of Claim 123, wherein the aqueous solution selectively removes the low-k dielectric material at an etch selectivity ratio for the dielectric material to organic material of about 50:1 to about 1000:1.

125. The method of Claim 123, wherein the aqueous solution selectively removes the dielectric material at a rate of greater than about 1000 angstroms per minute.

126. The method of Claim 123, wherein the aqueous solution selectively removes the dielectric material at a rate of greater than about 2000 angstroms per minute.

131. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material and up to a minimal amount of organic material therefrom; the aqueous solution comprising about 63-70% hydrofluoric acid and about 30-36% organic acid, and having a pH of about 2 to about 6.

132. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material therefrom at a rate of greater than about 2000 angstroms per minute; the aqueous solution comprising about 63-70% hydrofluoric acid and about 30-36% organic acid, and having a pH of about 2 to about 6.

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133. (amended) A method of treating a surface of a semiconductor substrate, comprising the step of:

*Dmg*  
applying an aqueous solution to the surface of the semiconductor substrate to selectively remove low-k dielectric material therefrom at an etch selectivity ratio for the dielectric material to organic material of about 50:1 to about 1000:1; the aqueous solution comprising about 63-70% hydrofluoric acid and about 30-36% organic acid; the composition having a pH of about 2 to about 6.

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146. (amended) A method of treating a wafer surface, comprising the steps of:

*D1*  
providing a wafer surface bearing overlying material thereon, the overlying material comprises a dielectric layer and an overlying layer comprising an organic material; and

treating the wafer surface by removing at least a portion of the dielectric layer from the wafer surface by applying an aqueous solution comprising hydrofluoric acid and one or more organic acids in a ratio of about 2:1 (v/v), the solution having a pH of about 2 to about 5.

147. (amended) The method of Claim 146, wherein the method comprises selectively removing the dielectric layer at a rate greater than about 2000 angstroms per minute.

148. (amended) The method of Claim 147, wherein the method comprises selectively removing the dielectric layer at a rate of about 2300 to about 2700 angstroms per minute.

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*D8*  
150. The method of Claim 146, wherein the organic acid is selected from the group consisting of citric acid, gallic acid, acetic acid, formic acid, propionic acid, n-butyric acid, isobutyric acid, benzoic acid, ascorbic acid, gluconic acid, malic acid, malonic acid, oxalic acid, succinic acid, tartaric acid, and mixtures thereof.

151. The method of Claim 146, wherein the organic acid is selected from the group consisting of citric acid, acetic acid, ascorbic acid, and mixtures thereof.

## Replacement Claims

152. (amended) A method for surface treating wafer surfaces, comprising the steps of:  
providing a wafer surface having a dielectric layer disposed thereon and a photoresist layer overlying the dielectric layer; and

*D9* treating the wafer surface to remove at least a portion of the dielectric layer with minimal removal of the photoresist layer, by applying an aqueous 2:1 (v/v) solution of hydrofluoric acid and one or more organic acids, the solution having a pH of about 2 to about 5, such that the dielectric layer is selectively removed at a rate of greater than about 2000 angstroms per minute.

153. (amended) The method of Claim 152, wherein the method comprises selectively removing the dielectric layer at a rate of about 2300 to about 2700 angstroms per minute.

155. (amended) A method of treating a surface of a semiconductor substrate, comprising the steps of:

*D9* applying an aqueous solution to the surface of the substrate to selectively remove dielectric material; the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5.

157. (amended) The method of Claim 155, wherein the method comprises selectively removing the dielectric layer at a rate of greater than about 2000 angstroms per minute.

*D10* 158. (amended) A method of treating a surface of a semiconductor substrate, comprising the steps of:

applying an aqueous solution to the surface of the substrate to selectively remove dielectric material, the aqueous solution comprising hydrofluoric acid and an organic acid in a ratio of about 2:1 (v/v), and having a pH of about 2 to about 5; wherein the aqueous solution removes the dielectric material at a rate of greater than about 2000 angstroms per minute.